

A photograph of a renewable energy farm at sunset. In the foreground, rows of solar panels are visible, reflecting the golden light of the setting sun. In the background, several wind turbines stand on a grassy hillside. The sky is a clear, pale blue, and the sun is low on the horizon, creating a lens flare effect.

# Cold-Related Injury Prevention



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# How Cold is too Cold?

- Extreme cold and its effects can vary depending on location.
- A cold environment forces the body to work harder to maintain its temperature.
- Cold stress occurs by driving down the skin temperature and eventually the internal body temperature (core temperature).



## On the Job

- Many people are exposed to cold temperatures and winter weather conditions on the job, both indoor and outdoor environments.
- Remember to check the temperature ratings for the common types of equipment and PPE that your teams are using in the field to ensure they are within the appropriate operational requirements/specifications.
- Please take note of wind specific activities that may be exacerbated by cold weather conditions when working at height, coming in contact with metal surfaces, etc...

# On the Job

Equipment	Description	Min. Temp. Rating
Harnesses	Skylotech Harness G0051	-35°C/-31°F
	DBI SALA ExoFit	-35°C/-31°F
Helmets	UVEX pheos E-S-WR	-30°C/-22°F
	Petzl Vertex Best Canada Vers.	-30°C/-22°F
Lanyards	Petzl lanyard	-40°C/-40°F
	DBI SALA Force 2	-35°C/-31°F
Vertical life line	DBI SALA Lad-Saf	-35°C/-31°F
Descent devices	Tractel Derope	-35°C/-31°F
Cell phones	iPhone	-20°C/-4°F
Sat. phones	Global Star 9600	-20°C/-4°F
Multimeters	Fluke 179	-10°C/14°F
Ladder Runner	Bornack RS S05 CSA	-30°C/-22°F
LMB Ladder System	Normal Climate	-20°C/-4°F
	Cold Climate	-40°C/-40°F
Service lifts	Dolphin V CE 240 and 350	-15°C/5°F
	EL3 CSA Service Hoist	-20°C/-4°F
	Power Climber	-29°C/-20.2°F

The temperature rating will vary depending on the brand and model for all equipment listed. Therefore, always validate the temperature rating of the equipment before using it in low temperatures. The temperature rating is independent of the apparent temperature. It depends on the thermometer value, regardless of the wind chill.

# On the Job

- Performing operations in the following weather conditions have a high potential for causing cold-related injuries:
  - Ice
  - Ice fog
  - Wind
  - Snow
  - Drifting-snow
  - White-out conditions
  - Direct physical contact with cold objects

# Work/Rest Recommendations

## Work/Warm-up Schedule for a 4-Hour Shift

Air Temperature--Sunny Sky		No Noticeable Wind		5 mph Wind		10 mph Wind		15 mph Wind		20 mph Wind	
°C (approximate)	°F (approximate)	Maximum Work Period	Number of Breaks								
-26 to -28	-15 to -19	(Normal Breaks ) 1		(Normal Breaks ) 1		75 min	2	55 min	3	40 min	4
-29 to -31	-20 to -24	(Normal Breaks ) 1		75 min	2	55 min	3	40 min	4	30 min	5
-32 to -34	-25 to -29	75 min	2	55 min	3	40 min	4	30 min	5	Non-emergency work should cease	
-35 to -37	-30 to -34	55 min	3	40 min	4	30 min	5	Non-emergency work should cease			
-38 to -39	-35 to -39	40 min	4	30 min	5	Non-emergency work should cease					
-40 to -42	-40 to -44	30 min	5	Non-emergency work should cease							
-43 & below	-45 & below	Non-emergency work should cease									

Schedule applies to any 4-hour work period with moderate to heavy work activity; with warm-up periods of ten (10) minutes in a warm location and with an extended break (e.g. lunch) at the end of the 4-hour work period in a warm location.

*Adapted from ACGIH 2012 TLVs*

This chart does not take into account job-specific factors, as such, please consider the influence the items discussed on the previous slide may have when assessing your risk for the task to be performed.

# Types of Cold-related Illnesses

<b>Hypothermia</b>	<p>Normal body temperature (98.6°F) drops to 95°F or less.</p> <p><b>Mild Symptoms:</b> alert but shivering.</p> <p><b>Moderate to Severe Symptoms:</b> shivering stops; confusion; slurred speech; heart rate/breathing slow; loss of consciousness; death.</p> <p><b>Hypothermia is a medical emergency. Call 911 or your local EMS for hypothermia immediately.</b></p>
<b>Frostbite</b>	<p>Body tissues freeze, e.g., hands and feet. Can occur at temperatures above freezing, due to wind chill. May result in amputation.</p> <p><b>Symptoms:</b> numbness, reddened skin develops gray/ white patches, feels firm/hard, and may blister.</p>
<b>Trench Foot (also known as Immersion Foot)</b>	<p>Non-freezing injury to the foot, caused by lengthy exposure to wet and cold environment. Can occur at air temperature as high as 60°F, if feet are constantly wet.</p> <p><b>Symptoms:</b> redness, swelling, numbness, and blisters.</p>

# Cold-related Injuries

- Excessive exposure to cold can cause a range of cold-related injuries, from Hypothermia and frostbite, to trench foot. Hypothermia can result in death and requires **immediate medical attention**.
- Exposure to cold weather can also increase the risk of injuries because of dangerous driving conditions, chances of becoming stranded, shedding ice, slippery surfaces, ergonomics / material handling and dehydration.

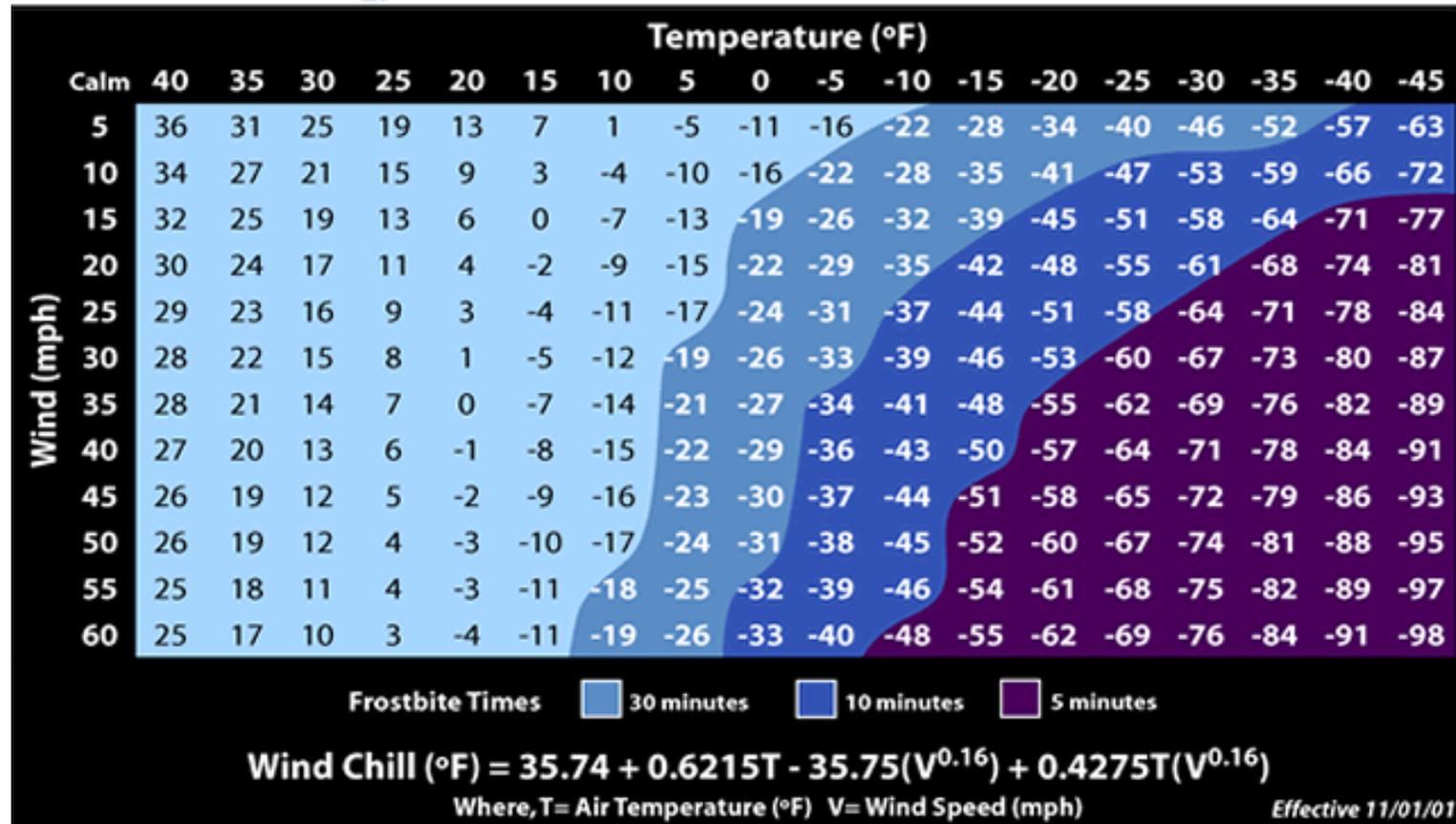
Call **911** for hypothermia!

**911**

# Wind Chill Chart



## Wind Chill Chart



This chart does not take into account job-specific factors, as such, please consider the influence the items discussed on the previous slide may have when assessing your risk for the task to be performed.

# Cold Weather Exertion

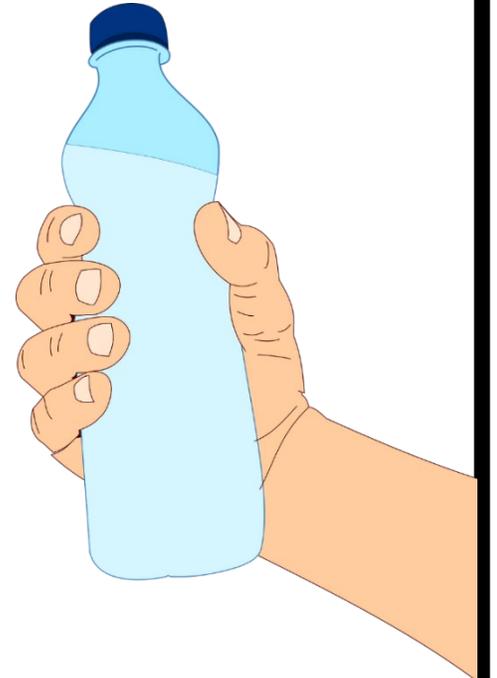
- Sweating in cold weather can increase risk for a lower body temperature and hypothermia.
- Sweating conducts heat **away** from the body 25 times faster than dry air.
- Heavy clothing and over exertion can increase this risk, as such layer appropriately.
- Remember to layer with natural fibers. This will allow for proper ventilation as well as protect from any potential electrical-arc related hazards.



Please refer to your company policy and procedures recalling cold weather gear.

# Stay Hydrated

- Hydration and regular meals are essential in preventing cold stress and dehydration. Consider replacing one (1) cup of water with one (1) cup of electrolyte drink.
- Ensure personnel are in a fit condition and have not experienced a previous cold injury. This should not preclude a person from work, but be aware, monitor closely and take precautions.
- Report any cold-injury related symptoms as soon as they are apparent. Activate Emergency Action Plan if appropriate.



# Vehicle Preparation

- Plan your route in advance.
- Check the weather forecast prior to departure.
- If your route changes, be sure to let someone know.
- Be sure to communicate departure and arrival.
- Review Emergency Action Plan.
- Snow drifts can hide various objects/hazards (e.g. fire hydrants, fences, signs, ditches, other vehicles).
- Use of snow mobile, snow cats, snow chains when appropriate.

# Vehicle Preparation

- Ensure a **Vehicle Emergency Kit** is available and inspected.
- **Kits Should Include (at a minimum):**
  - Blankets, water, food, flashlight, windshield scraper / shovel, cat litter (for traction), hand warmers, visibility flag, lock deicer, cell phone charger, **winter** windshield washer fluid, jumper cables, battery chargers.
- **Vehicle Preparation Should Include:**
  - Exhaust pipe clear from blockages
  - Stomp-out snow around vehicle
  - Fuel tank minimum  $\frac{1}{2}$  full
  - Snow tires/snow chains





# Pre-Work Icing Checklist

- ✓ Know the weather
- ✓ Icing typically occurs when moisture is present, around 26 – 32 F.
- ✓ Follow your company's icing policy/procedure.
- ✓ If possible initiate remote shutdown of turbine.
  - **DO NOT** hard stop, E-Stop to prevent possible shedding.
- ✓ Inspect the turbine prior to approaching and maintain approach distances until verification of shedding.
- ✓ If shedding occurs, **STAY IN TURBINE** and **DO NOT EXIT VEHICLE**. Seek cover.
- ✓ Take caution when walking in parking lots and around turbines. Getting in and out vehicles and on stairways.
- ✓ **DO NOT** approach turbine alone, at any time.

# Wind Chill Hazards

Wind Chill	Exposure Risk	Health Concerns	What to Do
0 to -9	<b>Low Risk</b>	Slight increase in discomfort	Dress warmly Stay dry
-10 to -27	<b>Moderate Risk</b>	Uncomfortable  Risk of <b>hypothermia</b> and <b>frostbite</b> if outside for long periods without adequate protection.	Dress in layers of warm clothing, with an outer layer that is wind-resistant. Wear a hat, mittens or insulated gloves, a scarf, neck tube or face mask and insulated, waterproof footwear. Stay dry Keep active.
-28 to -39	<b>High Risk:</b> exposed skin can freeze in 10 to 30 minutes	Very high risk of <b>frostnip</b> or <b>frostbite</b> : Check face and extremities frequently for numbness or whiteness.  Very high risk of <b>hypothermia</b> if outside for long periods without adequate clothing or shelter from wind and cold.	Dress in layers of warm clothing, with an outer layer that is wind-resistant. Cover all exposed skin. Wear a hat, mittens or insulated gloves, a scarf, neck tube or face mask and insulated, waterproof footwear. Stay dry Keep active.
-40 to -47	<b>Very High risk:</b> exposed skin can freeze in 5 to 10 minutes	Very high risk of <b>frostbite</b> : Check face and extremities frequently for numbness or whiteness.  Very high risk of <b>hypothermia</b> if outside for long periods without adequate clothing or shelter from wind and cold.	Dress in layers of warm clothing, with an outer layer that is wind-resistant. Cover all exposed skin. Wear a hat, mittens or insulated gloves, a scarf, neck tube or face mask and insulated, waterproof footwear. Stay dry Keep active.
-48 to -54	<b>Severe risk:</b> exposed skin can freeze in 2 to 5 minutes	Severe risk of <b>frostbite</b> : Check face and extremities frequently for numbness or whiteness.  Severe risk of <b>hypothermia</b> if outside for long periods without adequate clothing or shelter from wind and cold.	Be careful. Dress very warmly in layers of clothing, with an outer layer that is wind-resistant. <b>Cover all exposed skin</b> Wear a hat, mittens or insulated gloves, a scarf, neck tube or face mask and insulated, waterproof footwear. <b>Be ready to cut short or cancel outdoor activities.</b> Stay dry. Keep active.
-55 and colder	<b>Extreme risk:</b> exposed skin can freeze in less than 2 minutes	<b>DANGER!</b> Outdoor conditions are <b>hazardous</b> .	<b>Stay indoors</b>

# References

**The National Institute for Occupational Safety and Health (NIOSH)** [www.cdc.gov/niosh/topics/coldstress](http://www.cdc.gov/niosh/topics/coldstress)

**Occupational Safety and Health Administration (OSHA)**  
[www.osha.gov/SLTC/emergencypreparedness/guides/cold.html](http://www.osha.gov/SLTC/emergencypreparedness/guides/cold.html)

**Canadian Centre for Occupational Health & Safety**  
[www.ccohs.ca/oshanswers/phys\\_agents/cold\\_working.html](http://www.ccohs.ca/oshanswers/phys_agents/cold_working.html)



**Thank you.**

Questions? Contact [safety@cleanpower.org](mailto:safety@cleanpower.org)