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1. Purpose

University of Alaska Anchorage (UAA) personnel, student workers, faculty, staff, and outside contractors who work in cold environments in the course of their work functions, risk cold stress which could result in serious injury. The hazards associated with prolonged work in cold environments can be substantially reduced by taking precautions. This program for Cold Stress Safety is intended to ensure workers are knowledgeable in the hazards when working in cold environments and the steps to be taken to protect themselves and others.

2. Objective

UAA, in its continuing effort to provide personnel with safe, healthful working conditions, and to comply with the Occupational Safety and Health Act is implementing the following program for cold stress safety to protect people working at the University, by helping personnel, student workers, faculty, staff, and outside contractors better understand cold stress safety and fall prevention.

3. Scope

This program applies to UAA personnel, student employees, faculty, staff, and outside contractors working at UAA in cold environments.

4. Definitions

Acclimatization - The process by which you become physically adjusted to the temperature of your environment

Cold stress -occurs by driving down the skin temperature, and eventually the internal body temperature. When the body is unable to warm itself, serious cold-related illnesses and injuries may occur, and permanent tissue damage and death may result.

Hypothermia - the condition of having an abnormally low body temperature, typically one that is dangerously low

Frostbite - injury to body tissues caused by exposure to extreme cold, typically affecting the nose, fingers, or toes and sometimes resulting in gangrene

Trench foot - a medical condition caused by prolonged exposure of the feet to damp, unsanitary, and cold conditions

Chilblain - the painful inflammation of small blood vessels in your skin that occur in response to repeated exposure to cold but not freezing air

Windbreak - wall, or screen, that provides shelter or protection from the wind

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5. Authority and Responsibilities

In addition to the roles and responsibilities outlined in the UAA Training Program, the following apply to the Cold Stress Safety Program.

EHS/RM

- Works with departments upon request to determine safe procedures to protect personnel working in cold environments
- Create, track, and/or conduct inspections on cold stress where applicable with this standard

Supervisor

- Ensure personnel are trained to identify signs and symptoms of cold-related illness and strategies to reduced cold environment hazards
- Conduct periodic inspections of work in cold environments to ensure personnel have adequate means to prevent cold stress
- Monitor weather to ensure work plans take cold weather in consideration when applicable

Department Safety Coordinator

- Assist in the development of safe work plans and procedures when personnel must work in cold environments
- Conduct periodic inspections of work in cold environments in their department to ensure integrity

Personnel/Student Workers

- Understand the signs and symptoms of cold stress and be prepared to stop work or make changes when applicable
- Alerts department supervisor when work in cold environments is creating a hazard and assist in making plans to mitigate cold stress hazards
- Assesses work to determine if more controls are needed for work in cold environments

Outside Contractors

- Perform all work in compliance with their company's cold stress program, which will be reviewed and approved by the EHS/RM department ~~as approved by the EHS/RM department~~
- If the company does not have a program, they must comply with this program

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6. Hazards Associated with Work in Cold Environments

Personnel who work in a cold environment and exposed to extreme cold may be at risk of cold stress including the following:

- Hypothermia
- Frostbite
- Trench foot
- Chilblain
- Slips Trips and Falls

7. Engineering Controls

Engineering controls are design plans or changes to the working environment to prevent or reduce personnel exposure to potential fall hazards. The following example of engineering controls should be considered in area design to reduce the risk of cold stress:

- Installation of area heaters in the workplace to increase temperature in the work area
 - Heaters should have safety controls installed to prevent accidental fires.
- Installation of wind breaks or temporary shelter around the work area

8. Administrative Controls

Administrative controls are safe work practices and procedures designed to reduce the risks associated with working in cold environments. Examples of administrative controls include the following:

- Train personnel who work in cold environments on signs and symptoms of cold stress and common methods to protect themselves
- Adjust schedule of work ensure proper breaks can be taken to warm up
- Schedule outdoor work on days or time periods when the temperature will be higher and there will be less wind and precipitation
- Schedule work in pairs so personnel can monitor each other for signs of cold stress
- Acclimate workers to cold environments by gradually increasing the amount of time spent in the cold
- Ensure personnel have access to plenty of water

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9. Procedures

The following procedures will be followed when working in cold environment to avoid cold stress:

Supervisors must ensure personnel understand the signs and symptoms of cold stress and the actions to take if personnel are exhibiting symptoms. Signs and symptoms of cold stress and recommended responses can be found in Appendix A.

When working outdoors in cold weather or working in artificially cold environments, such as refrigerated areas, serious cold-related injuries and illnesses may occur. Cold related hazards can cause permanent tissue damage or even death.

Four factors contribute to cold stress: cold temperatures, high or cold wind, dampness and cold water. A cold environment forces the body to work harder to maintain its core temperature of 98.6°F. Cold air, water, and snow all draw heat from the body. While it is obvious that below freezing conditions combined with inadequate clothing could bring about cold stress, it is important to understand that it can also be brought about by temperatures in the 50°'s coupled with rain and/or wind.

Planning for work in cold environments is critical for preventing cold stress. Supervisors and personnel should monitor weather conditions and track temperature, wind chill temperature and expected precipitation prior to starting work in expected cold conditions. When work environments are expected to be cold, windy and wet the following will be considered to protect personnel working in those conditions:

General Cold Weather Work Practices

The following are general work practices to consider every time personnel are working in cold environments:

- When possible perform outdoor work during the warmer parts of the day
- Ensure there is an area where workers can take breaks out of the cold
- Drink plenty of warm liquids. It is easy to become dehydrated in cold weather.
- Avoiding caffeine and alcohol. Alcohol will accelerate loss of body heat.
- Eat high calorie snacks to help maintain body metabolism.
- Work in pairs to keep an eye on each other and watch for signs of cold stress.
- Never ignore shivering. Persistent or violent shivering is a symptom of oncoming hypothermia.
- Avoid exhaustion.
- Use tools with insulated handles

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Protective Clothing

UAA encourages personnel working in cold environments to be prepared by wearing adequate clothing for the expected weather including the following:

- Wear several layers of loose clothing. Layering provides better insulation. OSHA recommends the following three layers
 - An inner layer of wool, silk or synthetic to keep moisture away from the body.
 - A middle layer of wool or synthetic to provide insulation even when wet.
 - An outer wind and rain protection layer that allows some ventilation to prevent overheating.
 - Clothing made of cotton is not recommended for cold weather. It absorbs moisture and traps it next to your skin
- Hat or hood to keep you whole body warmer, and reduce the amount of heat lost through your head
- Breathable Mask to cover the face and mouth if needed
- Insulated gloves or mittens
- Insulated and/or waterproof footwear
- Warm socks – wool or synthetic blends

Work Schedules

The American Conference of Governmental Industrial Hygienists (ACGIH) developed the following Work/Warm-up Schedules for a 4-hour shift shown in Table 1 and Table 2. These schedules take both air temperature and wind speed into account, to provide recommendations on scheduling work breaks and ceasing non-emergency work. The first schedule is for light work (mostly standing, little to no movement) and the second is for moderate to heavy work.

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Table 1: ACGIH Work/Warm Schedule for Light Work Over a 4-Hour Shift

Air Temperature in °F Sunny Sky	No Wind		5 mph Wind		10 mph Wind		15 mph Wind		20 mph Wind	
	Max Work Period	No. of 10 min. Breaks	Max Work Period	No. of 10 min. Breaks	Max Work Period	No. of 10 min. Breaks	Max Work Period	No. of 10 min. Breaks	Max Work Period	No. of 10 min. Breaks
10 to 14	No recommendations		No recommendations		No recommendation		No recommendation		120 min	1
5 to 9							120 min.	1	120 min	1
0 to 4					120 min	1	120 min	1	75 min	2
-1 to -5					120 min	1	120 min	1	75 min	2
-10 to -14	120 min	1	120 min	1	75 min	2	55 min	3	40 min	4
-15 to -19	120 min	1	75 min	2	55 min	3	40 min	4	30 min	5
-20 to -24	75 min	2	55 min	3	40 min	4	30 min	5	Non-emergency work should stop.	
-25 to -29	55 min	3	40 min	4	30 min	5	Non-emergency work should stop.			
-30 to -34	40 min	4	30 min	5	Non-emergency work should stop.					
-35 to -39	30 min	5	Non-emergency work should stop.							
-40 to -44	Non-emergency work should stop.									
-45 to below	Non-emergency work should stop.									

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Table 2: ACGIH Work/Warm Schedule for Moderate and Heavy Work Over a 4-Hour Shift

Air Temperature in °F Sunny Sky	No Wind		5 mph Wind		10 mph Wind		15 mph Wind		20 mph Wind	
	Max Work Period	No. of 10 min. Breaks	Max Work Period	No. of 10 min. Breaks	Max Work Period	No. of 10 min. Breaks	Max Work Period	No. of 10 min. Breaks	Max Work Period	No. of 10 min. Breaks
5 to 9	No recommendations		No recommendations		No recommendation		No recommendation		120 min	1
0 to 4							120 min	1	120 min	1
-1 to -5					120 min	1	120 min	1	75 min	2
-10 to -14					120 min	1	120 min	1	75 min	2
-15 to -19	120 min	1	120 min	1	75 min	2	55 min	3	40 min	4
-20 to -24	120 min	1	75 min	2	55 min	3	40 min	4	30 min	5
-25 to -29	75 min	2	55 min	3	40 min	4	30 min	5	Non-emergency work should stop.	
-30 to -34	55 min	3	40 min	4	30 min	5	Non-emergency work should stop.			
-35 to -39	40 min	4	30 min	5	Non-emergency work should stop.					
-40 to -44	30 min	5	Non-emergency work should stop.							
-45 to below	Non-emergency work should stop.									

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10. NOAA Wind Chill Chart

Wind Chill Chart Wind (mph)

Temperature (°F)	Calm	5	10	15	20	25	30	35	40	45	50	55	60
40	36	34	32	30	29	28	28	27	26	26	25	25	25
35	31	27	25	24	23	22	21	20	19	19	18	17	17
30	25	21	19	17	16	15	14	13	12	12	11	10	10
25	19	15	13	11	9	8	7	6	5	4	4	3	3
20	13	9	6	4	3	1	0	-1	-2	-3	-3	-4	-4
15	7	3	0	-2	-4	-5	-7	-8	-9	-10	-11	-11	-11
10	1	-4	-7	-9	-11	-12	-14	-15	-16	-17	-18	-19	-19
5	-5	-10	-13	-15	-17	-19	-21	-22	-23	-24	-25	-26	-26
0	-11	-16	-19	-22	-24	-26	-27	-29	-30	-31	-32	-33	-33
-5	-16	-22	-26	-29	-31	-33	-34	-36	-37	-38	-39	-40	-40
-10	-22	-28	-32	-35	-37	-39	-41	-43	-44	-45	-46	-48	-48
-15	-28	-35	-39	-42	-44	-46	-48	-50	-51	-52	-54	-55	-55
-20	-34	-41	-45	-48	-51	-53	-55	-57	-58	-60	-61	-62	-62
-25	-40	-47	-51	-55	-58	-60	-62	-64	-65	-67	-68	-69	-69
-30	-46	-53	-58	-61	-64	-67	-69	-71	-72	-74	-75	-76	-76
-35	-52	-59	-64	-68	-71	-73	-76	-78	-79	-81	-82	-84	-84
-40	-57	-66	-71	-74	-78	-80	-82	-84	-86	-88	-89	-91	-91
-45	-63	-72	-77	-81	-84	-87	-89	-91	-93	-95	-97	-98	-98



Frostbite Times	
■	30 minutes
■	10 minutes
■	5 minutes



10.11. Inspections

To ensure UAA personnel minimize exposure to cold stress injuries the following inspections should take place:

Prior to every job in a cold environment supervisors and personnel performing work should review the work plan to ensure precautions are taken to protect workers from cold conditions.

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11.12. Training

UAA shall provide a training program for personnel working in cold environments as necessary and at least every two years.

The program shall enable personnel to recognize hazards related to cold stress, and shall train personnel in the procedures to be followed to minimize these hazards.

The employer shall ensure that personnel have been trained by a competent person in the following areas, as applicable:

- Detection of signs of cold stress
- Response when signs of cold stress are observed
- Procedures for minimization of cold stress injuries

Retraining shall be provided for personnel as necessary if an accident occurs, new workplace hazards are identified, a near loss incident has occurred, so that personnel maintain the understanding and knowledge acquired through compliance with this section.

12.13. Program Evaluation

The Cold Stress Safety program shall be evaluated on an annual basis utilizing the protocols set forth by EHS/RM. The evaluation team will consist of a department safety coordinator and a designee from EHS/RM. EHS/RM will define the scope of the evaluation. The final report will be developed by the EHS/RM utilizing the information received during the evaluation. The deficiencies determined in the report will be documented and corrective action plans will be developed.

13.14. References

- 29 CFR 1910.25, 1910.26, and 1910.27
- US OSHA Publication 3156 – Quick Reference Card

14.15. Revision History

Revision Number	Date Revised	Description of Change	Revised By	Approved By
1				
2				
3				

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Appendix A

Cold Stress Illnesses and Injuries Cold Stress Symptoms and First Aid from OSHA Cold Stress Guide

Hypothermia

Hypothermia occurs when body heat is lost faster than it can be replaced and the normal body temperature (98.6°F) drops to less than 95°F. Hypothermia is most likely at very cold temperatures, but it can occur even at cool temperatures (above 40°F), if a person becomes chilled from rain, sweat, or submersion in cold water.

What are the symptoms of hypothermia?

- Mild symptoms:
 - An exposed worker is alert.
 - He or she may begin to shiver and stomp the feet in order to generate heat.
- Moderate to Severe symptoms:
 - As the body temperature continues to fall, symptoms will worsen and shivering will stop.
 - The worker may lose coordination and fumble with items in the hand, become confused and disoriented
 - He or she may be unable to walk or stand, pupils become dilated, pulse and breathing become slowed, and loss of consciousness can occur. A person could die if help is not received immediately.

What can be done for a person suffering from hypothermia?

- Call 911 immediately in an emergency; otherwise seek medical assistance as soon as possible.
 - Move the person to a warm, dry area.
 - Remove wet clothes and replace with dry clothes, cover the body (including the head and neck) with layers of blankets; and with a vapor barrier (e.g. tarp, garbage bag). Do **not** cover the face.
- If medical help is more than 30 minutes away:
 - Give warm sweetened drinks if alert (no alcohol), to help increase the body temperature. Never try to give a drink to an unconscious person.

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- Place warm bottles or hot packs in armpits, sides of chest, and groin.
- Call 911 for additional rewarming instructions.
- If a person is not breathing or has no pulse:
 - Call 911 for emergency medical assistance immediately.
 - Treat the worker as per instructions for hypothermia, but be very careful and do not try to give an unconscious person any fluids.
 - Check him/her for signs of breathing and for a pulse. Check for 60 seconds.
 - If after 60 seconds the affected worker is not breathing and does not have a pulse, trained workers may start rescue breaths for 3 minutes.
 - Recheck for breathing and pulse, check for 60 seconds.
 - If the worker is still not breathing and has no pulse, continue rescue breathing.
 - Only start chest compressions per the direction of the 911 operator or emergency medical services*
 - Reassess patient's physical status periodically.

*Chest compression are recommended only if the patient will not receive medical care within 3 hours.

Frostbite

Frostbite is an injury to the body that is caused by freezing of the skin and underlying tissues. The lower the temperature, the more quickly frostbite will occur. Frostbite typically affects the extremities, particularly the feet and hands. Amputation may be required in severe cases.

Frostbite Symptoms

- Reddened skin develops gray/white patches.
- Numbness in the affected part.
- Feels firm or hard.
- Blisters may occur in the affected part, in severe cases.

What can be done for a person suffering from frostbite?

- Follow the recommendations described above for hypothermia.
- Do not rub the affected area to warm it because this action can cause more damage.

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- Do not apply snow/water. Do not break blisters.
- Loosely cover and protect the area from contact.
- Do not try to rewarm the frostbitten area before getting medical help; for example, do not place in warm water. If a frostbitten area is rewarmed and gets frozen again, more tissue damage will occur. It is safer for the frostbitten area to be rewarmed by medical professionals.
- Give warm sweetened drinks, if the person is alert. Avoid drinks with alcohol.

Trench Foot

Trench Foot or immersion foot is caused by prolonged exposure to wet and cold temperatures. It can occur at temperatures as high as 60°F if the feet are constantly wet. Non-freezing injury occurs because wet feet lose heat 25-times faster than dry feet. To prevent heat loss, the body constricts the blood vessels to shut down circulation in the feet. The skin tissue begins to die because of a lack of oxygen and nutrients and due to the buildup of toxic products.

Trench Foot Symptoms

- Redness of the skin,
- Swelling
- Numbness
- Blisters

What can be done for a person suffering from immersion foot?

- Call 911 immediately in an emergency; otherwise seek medical assistance as soon as possible.
- Remove the shoes, or boots, and wet socks.
- Dry the feet.

Chilblains

Chilblains are the painful inflammation of small blood vessels in your skin that occur in response to repeated exposure to cold but not freezing air. Also known as pernio, chilblains can cause itching, red patches, swelling and blistering on your hands and feet. Chilblains usually clear up within one to three weeks, especially if the weather gets warmer.

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Chilblains symptoms

- Small, itchy red areas on your skin, often on your feet or hands
- Possible blistering or skin ulcers
- Swelling of your skin
- Burning sensation on your skin
- Changes in skin color from red to dark blue, accompanied by pain

What can be done for a person suffering from Chilblains?

- Rewarming affected skin gently, without massaging, rubbing or applying direct heat
- Avoiding cold exposure whenever possible
- Keeping your affected skin dry and warm, but away from sources of heat
- Applying lotion to alleviate itching
- Making sure the affected skin is cleaned with an antiseptic and gently bandaged to prevent infection
- Avoiding scratching
- Quitting smoking, as smoking can constrict your blood vessels and slow wound healing